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MAPPING GROWING CONDITIONS OF CROPS FROM LANDSAT DATA

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ABSTRACT

An automatic method of mapping crop growing conditions from Landsat data has been developed. The method uses only current Landsat data and yield models derived from historical Landsat and crop phenology data. These models have been developed for spring and winter wheat in the Northern Hemisphere environment. The maps are useful to marketing, international service and relief organizations in estimating domestic and foreign yields of major crops.

Growing conditions of crops are often evaluated by ground observation of the density of plants in grain fields. Landsat data were used in this study to estimate these densities. The method is based on the fact that a dense or closed green-vegetative canopy absorbs more incident radiation in Landsat Band 5 and reflects more in Band 7 than an open or sparse canopy. The densities were determined quantitatively by comparing the ratio of Band 7 to Band 5 intensities in standardized Landsat digital data to standard values for canopies of different densities. A biomass index is then calculated to express quantitatively the vegetation density of a sample area (10 km^2). These biomass indices are translated into yield estimates for wheat using regression models.

Maps showing the distribution of growing conditions of spring and fall seeded wheat by 10 km^2 areas within five Crop Districts have been used to estimate composite yields for wheat in these districts for the past five growing seasons. These estimates were within ± 10% of the reported yield for each District. The yield estimates for the 10 km^2 sample areas were even closer to the reported yields for these areas.

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